AGE DETERMINATION OF ANTARCTIC FISH

by

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ABSTRACT. – The authors accurately describe the technique of preparation and examination of otoliths and scales for ageing several antarctic fish species, mainly *Notothenia gibberifrons* and *Chaenocephalus aceratus.*

RÉSUMÉ. – Les auteurs décrivent avec précision les techniques de préparation et d'observation des otolithes et des écailles utilisées pour déterminer l'âge chez plusieurs espèces de poissons antarctiques, principalement *Notothenia gibberifrons* et *Chaenocephalus aceratus.*

INTRODUCTION

During November 1977 and March 1978 benthic and demersal fish were caught by trammel net and longline. Seventeen locations were sampled on the continental shelf of South Georgia at depths of 7-460m. *Chaenocephalus aceratus* and *Notothenia gibberifrons* were the species caught most commonly. Many fish were aged from otoliths by the technique outlined below. Further information on sampling sites, species, sex, length, weight and gonad index is given in White and North (1979).

COLLECTION

Otoliths and scales were removed directly from freshly caught fish and placed in glass vials with a label. The samples were then left to dry before being sealed for storage.

Otoliths

Preparation and examination

Whole otoliths were split through the nucleus (Figure 1) to give a transverse cross-section. A reliable way of splitting an otolith was found to be to wrap it in sellotape, place it on a surface such as a notebook and break the otolith with a sharp scalpel. If the ends of the sellotape were first turned over it was easy to pull apart and extract the otolith (Figure 2).

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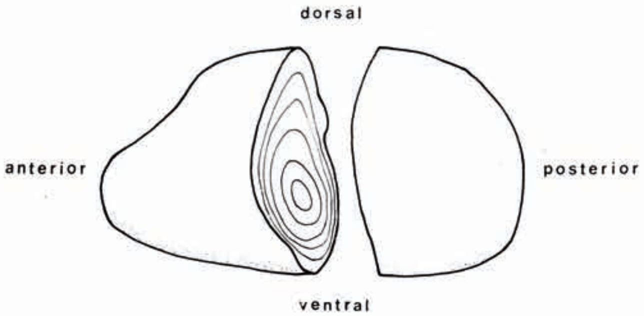

Fig. 1. – A diagram of a transverse cross section through an otolith.

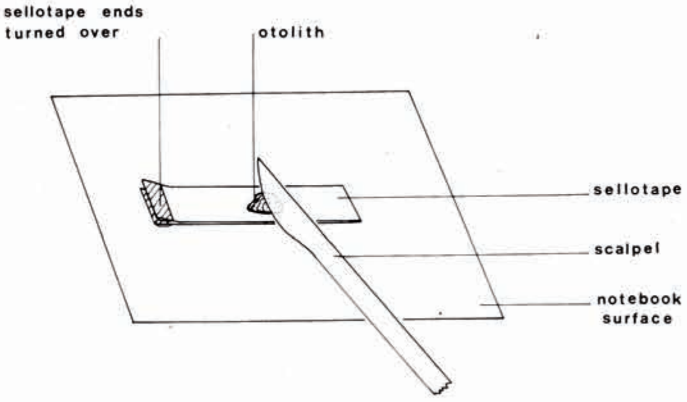

Fig. 2. – A diagram of the method used to split an otolith through the nucleus.

The rough split edges were smoothed by light hand grinding on a fine carborundum stone. Otoliths were then charred dark brown held on a spatula above the low «smoky» flame of a Bunsen burner. The degree of charring necessary to develop the annual zones was determined by trial and error as this was found to vary with the species and size of the otolith. It may be necessary to char to a grey colour to develop all annuli. Half otoliths were then viewed microscopically by mounting in plasticine on a glass slide using strong reflected light. Concentric dark charred zones were counted to determine age (Figure 3) as they became visible by clearing the otolith surface with cedar wood oil. For interpreting the otolith structure the advice of an experienced otolith reader was useful.

On close examination it was observed that the hyaline opaque border, the presumed winter-summer border appeared dark when viewed by reflected light.

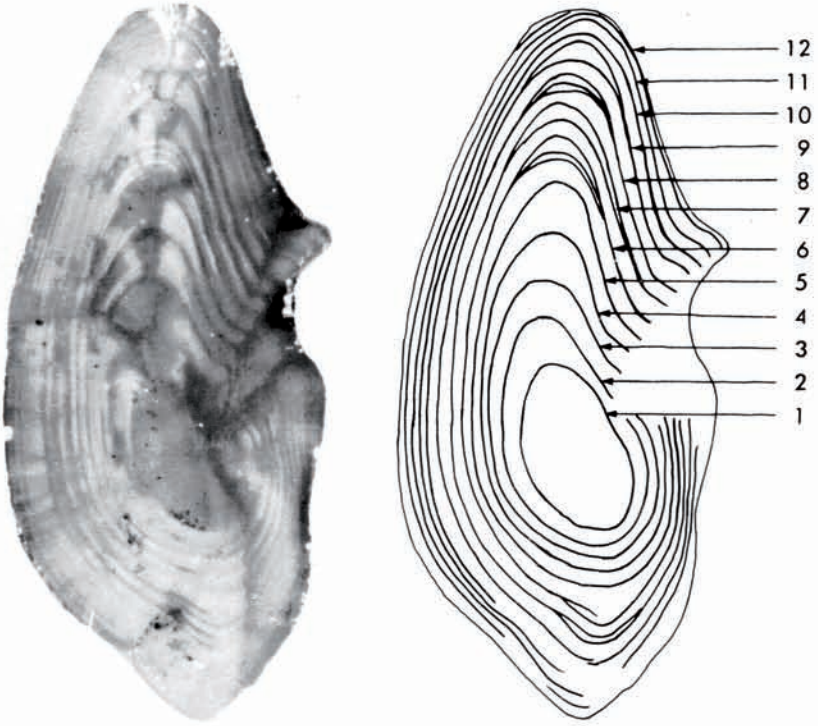

Fig. 3. – Photograph of a charred transverse section of an otolith of *Notothenia gibberifrons* and interpretation of the annuli in years.

Results

Increments assumed to be annual were counted to determine age, following the sequence in Figure 4. The ages assigned were reported in White and North (1979). It was observed that most fish caught in January to March has an opaque zone on the edge of the otolith. Because of this, fish counted as five years old

Age in months		0		5		12		17		24		29		36	38
Estimated length (mm)		15	30	60	75			150					230		
Life Stage	Spawn	Hatch		Pelagic		Demersal									
Year Class				0 class				1 class				2 class			
				1st Annulus				2nd Annulus				3rd Annulus			
Otolith Formation				Opaque		Hyaline		Opaque		Hyaline		Opaque		Hyaline	
				← Nucleus →											
Calendar month	May	Aug	Nov	Feb	May	Aug	Nov	Feb	May	Aug	Nov	Feb	May	Aug	Nov
Season		Winter		Summer		Winter		Summer		Winter		Summer		Winter	
Scale Formation						Check				Check				Check	

Fig. 4. – Age factors for *Notothenia rossii marmorata* during the first three years of life at South Georgia (year Class using 1st July as «birthday»).

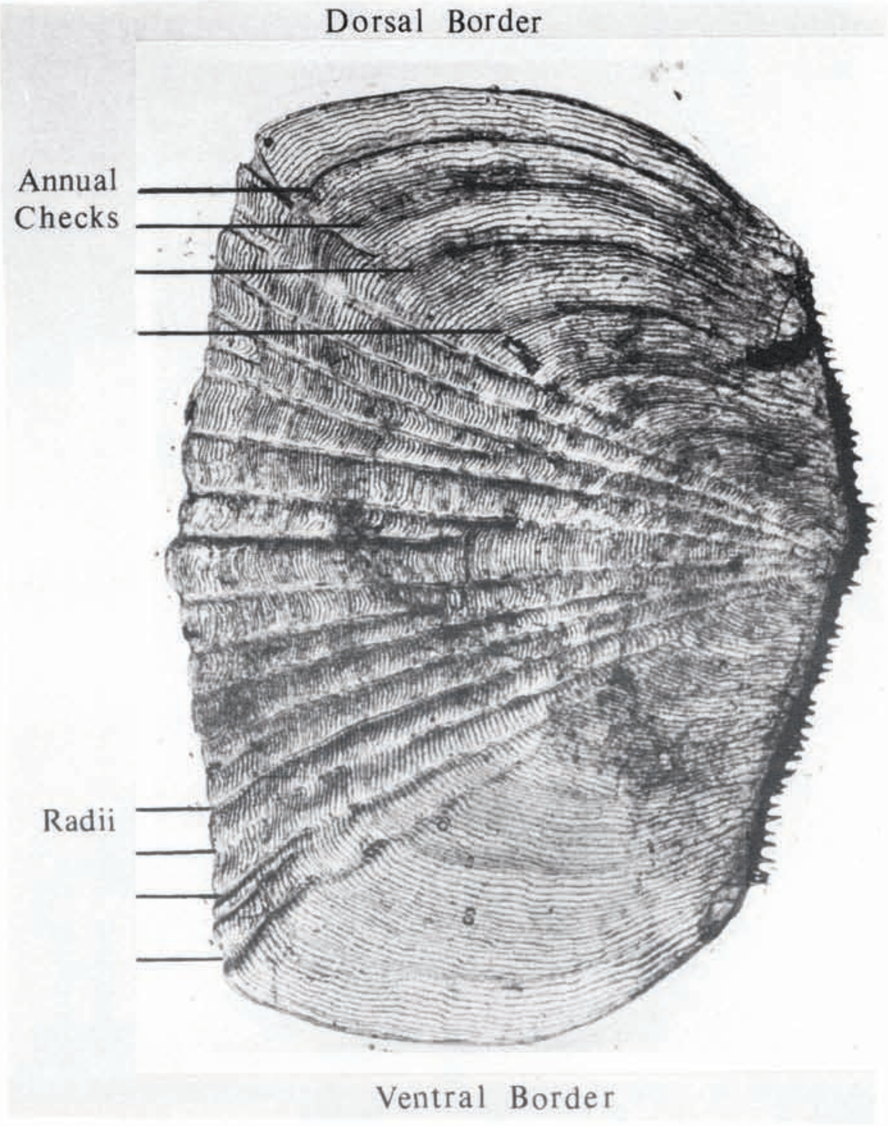

Fig. 5. – A scale of *Notothenia gibberifrons.*

(with 5 opaque zones including the nucleus) are in fact 4 1/2 years old since hatching but have experienced almost five summers' growth.

Scales

Scales were collected and stored as for otoliths. They were taken from posterior to the pectoral fin, where the largest and most regularly shaped scales were found. For juvenile fish with few replacement scales it was only necessary to take about 20 scales from each fish.

Preparation and examination

The dry cemented mass of scales obtained were soaked for about 1 hour in a mixture approximately 5 % glycérine, 20 % alcohol, 0.01 % detergent, and 75 % cold fresh water. Then gently separated with the fingers and mounted wet in labelled glass 35mm photographic transparency mounts, or sandwiched between labelled glass microscope slides held under pressure and glued at each end with D.P.X. artificial mounting medium. The scales dried flat when restrained in both types of mounts. The transparency mounts allowed the scales to be viewed by projection. The microscope slide mounts were more suitable for keeping the scales flat and were useful for examination with a binocular microscope using transmitted light.

Checks were observed on scales (Figure 5) and could be counted at the junction of the dorsal or ventral border and the first radius next to this.

CONCLUSIONS

With experience it was relatively easy to interpret otoliths by the method described above. For otoliths of *Notothenia gibberifrons* there was good agreement between readers on the probably age of the fish. However, for *Chaenocephalus aceratus* a smaller proportion of the otoliths were suitable for age determination by this method and the reader was less confident that the assigned age was the true age of the fish.

Scales were difficult to interpret, ages were inconsistent for different scales from the same fish, splits or false checks were harder to discriminate from true annual checks and in old fish the resolution of separate checks on the outer edge of the scale was very difficult.

The otolith charring technique may be useful for ageing Nototheniidae such as *Notothenia gibberifrons, Notothenia rossii* and *Dissostichus eleginoides.*

An official birthday for autumn spawning Antarctic fish of July 1st see Figure 4, may be useful for giving the fish a Year Class.

RÉFÉRENCE

WHITE, M.G. and A.W. NORTH. 1979. – Offshore Biological Programme : Ichthyological Data. *British Antarctic Survey Data Report*, No. 2, 25 pp.